

---

## ORIGINAL ARTICLE

---

### A web-based survey of the motivations and challenges faced by emerging researchers in the chiropractic profession

Katie de Luca, MChiro, Peter Tuchin, GradDipChiro, DipOHS, PhD, and Rod Bonello, DO, DC, MHA

---

**Objective:** To investigate the motivations, challenges and perceptions of the educational environment of emerging researchers in chiropractic.

**Methods:** A descriptive web-based survey of higher-degree chiropractic research students was performed between October and November 2013. The survey consisted of open and closed questions and the Dundee Ready Education Environment Measure.

**Results:** Twenty-two students currently enrolled in a higher-degree research program participated. Students were most commonly enrolled in a doctor of philosophy program at a part-time rate. Motivations of research were desire to improve the clinical care aspects of chiropractic for the public and belief that chiropractic research is lacking. The greatest challenges were the negative attitudes towards chiropractic, finding enough time to do everything required, and feelings of isolation. The higher-degree research educational environment was perceived to be more positive than negative, with the stimulating nature of research a positive feature. A negative feature of the educational environment was poor undergraduate preparation for higher-degree research.

**Conclusion:** This study is the first study to describe higher-degree chiropractic research students. Primary motivations included building research, while challenges included not only negative attitudes toward the chiropractic profession but also negative attitudes toward researchers from within the profession. The higher-degree research educational environment was perceived to be positive. By acknowledging the issues that surround emerging researchers in chiropractic, the profession is better placed to foster academics and build research capacity.

**Key Indexing Terms:** Chiropractic; Education, Graduate; Students, Health Occupations; Research

*J Chiropr Educ* 2015;29(2):151–158 DOI 10.7899/JCE-14-35

---

### INTRODUCTION

Often deliberated in the chiropractic profession is the importance of developing an evidence base to inform the public and develop policy on the scope and efficacy of chiropractic care. Evidence-based practice is the explicit and conscientious attempt to find the best available research evidence to assist health professionals in making the best decisions for their clients.<sup>1</sup> Its purpose is to assist in clinical reasoning, integrating evidence from research with clinical expertise, the client's values and circumstances, and the practice context.<sup>2</sup> International initiatives designed to increase research capacity in the field of chiropractic include the Norwegian Research Workshop, an initiative from the Norwegian Chiropractors' Association to increase research and upgrade research qualifications for the chiropractic profession in Norway.<sup>3</sup> Initiatives designed to bring together researchers and clinicians and close the gap include practice-based research

networks such as those in Canada.<sup>4</sup> In Australia, there is a need to develop and encourage intraprofessional as well as interprofessional collaboration and coordinate researchers on pertinent chiropractic issues. In building research capacity, a greater understanding of the motivations, challenges, and issues that surround career development in chiropractic research is necessary for the development and retention of early-career researchers.

The undergraduate chiropractic student experience is reported in the literature in terms of educational environment,<sup>5–7</sup> evidence-based practice,<sup>8</sup> and patient communication and clinical skills.<sup>9</sup> For instance, undergraduate students at the Scandinavian College of Chiropractic perceived that a sound educational environment is fostered by the institution. Items that scored consistently poorly included the lack of a support system for stressed students, authoritarian teachers, inadequate school time-tabling, and an overemphasis on factual learning.<sup>5</sup> In 2006, an update on research in chiropractic education from the

Research Agenda conference discussed the directions in key areas of interest and collaboration for the chiropractic profession but did not explore the student experience.<sup>10</sup>

The educational environment in medicine and in dentistry<sup>11</sup> has been investigated. (PHEEM) has been used to measure the educational environment in intensive care training in the United Kingdom<sup>12</sup> and in medical residence programs in Brazil,<sup>13</sup> Iran,<sup>14</sup> Saudi Arabia,<sup>15</sup> and Pakistan. A preliminary 54-item questionnaire on the education environment in ambulatory care has been assessed in Chile, with psychometric properties yet to be addressed.<sup>16</sup> The Dundee Ready Education Environment Measure (DREEM) inventory was used to assess the learning environment at 80 Japanese medical schools.<sup>17</sup> Different educational environments among universities may be partly responsible for the differences in perceived preparedness of medical students; of note only 17% of physicians-in-training felt prepared in the area of clinical skills, 19% in skills associated with evidence-based medicine, and 29% in basic knowledge of diagnosis and management of common conditions.<sup>7</sup> While both the PHEEM and DREEM tools have been used in describing health care educational environments, and existing chiropractic studies have limitations in that they focus on the undergraduate student experience and are conducted within a single tertiary institution, the present study utilizes a measure of educational environment in the context of Australian chiropractic higher-degree research students.

In Australia, higher-degree research (HDR) is the training platform to become an independent researcher. A master's degree may be completed as either a 1- to 2-year substantial research project or a professional skills coursework with a small research component. A doctor of philosophy (PhD) is an intensive, 3- to 4-year program of critical research skills and analysis that should significantly contribute to an emerging area of research. The HDR student is on a path to evaluate new and creative ideas generated from an intrinsic interest in a topic, supervised by senior academics and often collaborating with other researchers. The research experience at this stage is focused on the development of quality research: a specific aim, robust methodology, the analyses of data, and intellectual discussion on findings. With the chiropractic profession looking toward an evolving evidence base for the scope of efficacy of treatment, the role of the HDR student in engaging in a research career is important. As no research has been done to explore the experiences of HDR chiropractic students, there is a need for investigation into issues encountered by them.

To fill the clear and distinct research gap, this project was designed to provide the first information on the HDR chiropractic student experience in Australian universities and institutions. It offers a greater understanding of the motivations, challenges, and perceptions of the educational environment that surround career development in chiropractic research. The aims of this study are to (1) describe HDR chiropractic students, (2) identify the motivations and challenges that face HDR chiropractic

students, and (3) measure how HDR chiropractic students perceive their educational environment.

## METHODS

This study is a cross-sectional, web-based survey of HDR chiropractic students and was performed between October and November 2013. Ethics approval was granted by the Macquarie University Human Research Ethics Committee (reference number: 5201200604).

### Population

HDR chiropractic students were defined as any registered chiropractor enrolled in HDR as well as any HDR student whose primary research interest is related to chiropractic. Inclusion criteria included current enrollment in an HDR program. The sample was gathered by contacting chiropractic departments of higher-degree institutions, e-mails from professional organizations inviting participation, and snowball contact of chiropractic academics who enroll or supervise HDR students.

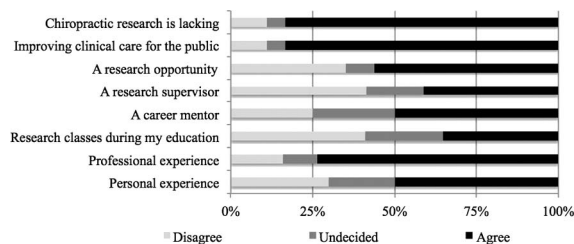
### Participants

Participants consented to partake in the study via an initial webpage that outlined the study, time taken to complete the study, and information as to where the results of the study would be disseminated. Participants then completed the online survey, which took approximately 15 minutes.

### Survey

A web-based survey consisting of open and closed questions and the DREEM was administered. Sociodemographic information was collected, and respondents' attitudes were measured using questions based on motivations and challenges of their research experience. The DREEM is an inventory of 50 statements directly relevant to educational climate in medical schools and other health profession institutes.<sup>18</sup> The DREEM is the most widely used contemporary measure of the medical education environment<sup>19</sup>; has been used in a variety of health care settings, including medical,<sup>20</sup> dental,<sup>21</sup> nursing,<sup>22</sup> and chiropractic<sup>23</sup>; and is a tool for international comparisons between medical schools.<sup>24</sup> The DREEM is designed for undergraduate studies and has only been tested for validity and reliability in these contexts. With the PHEEM used in medical residency programs often situated in the hospital setting, the authors felt the DREEM more closely represented the context of the higher-degree research experience based at the tertiary institution. The modified version of the DREEM utilized by the authors has not been psychometrically tested.

The DREEM was modified to explore the educational environment of HDR chiropractic students (Appendix A). The DREEM score ranges from 0 to 200, and an approximate guide to interpreting the overall score is very poor (0–50), problematic (51–100), more positive than negative (101–150), and excellent (151–200). The DREEM includes 5 subscales: students' perception of learning, students' perception of course organizers (supervisors),



**Figure 1** - Motivations of higher-degree research chiropractic students.

students' academic self-perceptions, students' perceptions of atmosphere, and students' social perception. It is recommended for targeting specific strengths and weaknesses within the educational environment. Items with a mean score  $>3.5$  are interpreted to be positive and  $<2$  interpreted to be problematic. Open-ended questions were read, with coding done by hand to review for major themes.

### Data Analysis

Data were collated by Survey Monkey and exported for analysis to STATA 12.0 (StataCorp LP, College Station, TX, USA). Means and frequencies were computed to describe the sample.

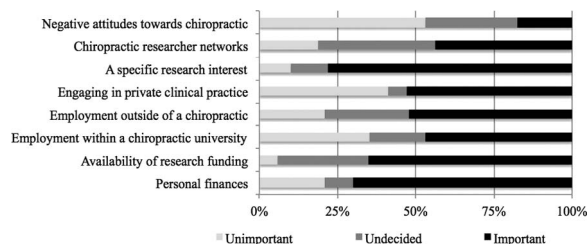
## RESULTS

### Demographics

Seventy-three people responded to the advertising for participation in an online survey looking at the educational environment and learning experiences of chiropractic HDR students; 22 students currently enrolled in an HDR program at an Australian university or tertiary institution were eligible to participate and were included in the survey. There were no outlying data. Nearly two-thirds (17/26, 65.4%) of participants were male, and the most-common age groups of participants were 25–34 years and 45–54 years (9/26, 34.6% each). The most-common program of HDR enrollment was a PhD (16/26, 61.5%) at a part-time rate (15/25, 60%). The majority of participants did not hold a scholarship (15/25, 60%), but of the 10 participants who did, scholarships were received primarily from the Australian Postgraduate Award scheme and the Chiropractic and Osteopathic College of Australasia Research Ltd. Most participants felt adequately supported by their universities and faculties/schools (15/20, 75% and 17/20, 85%, respectively). Most students had started their HDR studies within the previous 3 years and anticipated completing their studies within the upcoming 3 years.

### Motivations

Figure 1 displays the responses to questions on motivations for entering HDR. The most-common reasons included desire to improve the clinical care aspects of chiropractic for the public and belief that chiropractic research is lacking (15/18, 83.3% of participants each). In regard to HDR chiropractic students continuing to engage in research, the most-important reasons for career



**Figure 2** - Reasons important to higher-degree research chiropractic students.

retention were a specific area of interest (14/18, 78%) and personal finances (12/17, 70%). The least important reason was negative attitudes toward chiropractic (Fig. 2).

### Challenges

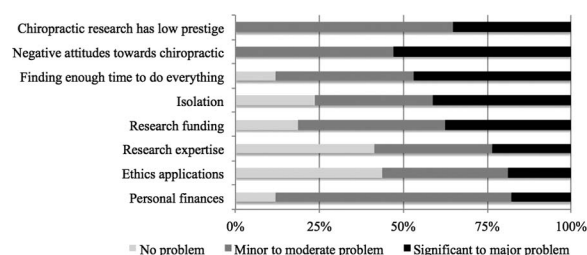
The greatest challenges (rated significant to major problem) faced by HDR chiropractic students include negative attitudes toward chiropractic (9/17, 53%), finding enough time to do everything required (8/17, 47%), and feelings of isolation (7/17, 41%). Regular contact with other researchers in chiropractic was reported by (12/17) 70.6% of participants, with frequency of contact as follows: (6/17) 35.3% had monthly contact, (4/17) 23.5% had weekly contact, (3/17) 17.6% had half-yearly contact, 11.8% had daily contact, and 11.8% only had contact once a year or less (never) (2/17 respectively). Over half of the participants felt that their universities, faculties/schools, or supervisors did not provide sufficient opportunities to be in contact with other researchers. Significantly, (12/17) 70.6% of participants would like more opportunities to have contact with other chiropractic researchers. Figure 3 displays the responses to questions on the challenges faced by HDR chiropractic students.

### Educational Environment

The results from the DREEM total score and 5 subscales are shown in Table 1. Individual items that had a mean score  $>3.5$  and interpreted as positive and items that had a mean score  $<2$  and interpreted as problematic and are shown in Table 2.

## DISCUSSION

While most chiropractic students opt for clinical practice, a small number of students venture into HDR.



**Figure 3** - Challenges faced by higher-degree research chiropractic students.

**Table 1 - Mean DREEM Total and Subscales Scores for HDR Chiropractic Students.**

|   | Mean ± SD    | Guide Subscale Interpretation     |
|---|--------------|-----------------------------------|
| DREEM total score                         | 132.6 ± 19.5 | More positive than negative       |
| Students' perception of learning          | 35.4 ± 5.2   | A more positive perception        |
| Students' perception of course organizers | 35.4 ± 7.6   | Model course organizers           |
| Students' academic self-perceptions       | 20.2 ± 3.4   | Feeling more on the positive side |
| Students' perceptions of atmosphere       | 30.6 ± 4.2   | A more positive attitude          |
| Students' social perception               | 17.1 ± 3.4   | Not too bad                       |

Abbreviations: DREEM, Dundee Ready Education Environment Measure; HDR, higher-degree research.

This project is the first study to outline the motivations, challenges and perceptions of the educational environment that surround chiropractic students engaged in research. Twenty-two students met inclusion criteria for this study, most of whom were PhD students enrolled in part-time study and not supported by a scholarship.

### Motivations

Motivations of HDR students were assessed via their interests in chiropractic research and their reasons for entering the field of research. HDR chiropractic students felt that chiropractic research is lacking, and this gap in evidence for the scope and breadth of chiropractic care was the most agreed-upon motivation for HDR. Furthermore, by engaging in research, HDR students agreed that they are able to improve the lives of people who visit a chiropractor and the view of “the profession and our standing within the scientific community.” Common open-ended answers to why they became interested included the lack of evidence-based information in undergraduate teaching and in clinical practice. Specifically, the “lack of cultural authority for the profession” was noted as a motivation for HDR chiropractic research. A specific area of interest was the most-important reason for HDR chiropractic students continuing to engage in research. One HDR student felt the “profession has a great opportunity now to begin studies to show its safety and cost-effectiveness.”

### Challenges

An interesting finding was that while negative attitudes toward chiropractic were an unimportant reason to engage in research, such negative attitudes were the largest problems faced by HDR chiropractic students. Unfortunately, HDR chiropractic students felt that negative attitudes from outside the profession were replicated from within the profession, with all students reporting some problem faced because of the low prestige of chiropractic research. Open-ended comments included the following:

“The lack of support from chiropractors has been extremely disappointing. Both financial support but mostly the disdain and lack of interest in research is the most difficult.” “The chiropractic profession has done little but hinder the progress of my research.” “You do not get any encouragement from the profession.” Remarkably, 14 students reported a lack of professional support and/or recognition from within the profession as a major barrier to retention.

Other major problems included time management, a sense of isolation, and gaining access to funding opportunities. While most students reported regular contact with other researchers, up to three-quarters felt isolated and would like more opportunities for student interaction. There are currently several networks of emerging researchers; of note are International Collaboration of Early Career Researchers and Emerging Researchers in Ageing; both are funded programs to build student cohesion and provide support, as well as respected forums to engage in career development and collaboration. Is the only option to participate in external programs such as these, or can HDR students coordinate interprofessional HDR student networks at a national or international level? Finally, a challenge faced by HDR chiropractic students is that of information and skills based around funding availability. It is suggested a funded program such as an Emerging Researchers in Chiropractic forum to moderate feelings of isolation, engage collaborative research efforts, and provide access to funding and scholarship information would be beneficial for promoting interaction between students.

### Perceptions of the Educational Environment

The perception of the educational environment of specific tertiary institutions was not in the scope of this project; however, the overall scope of the perception of the educational environment of HDR was scored more positive than negative, as measured by the DREEM, a measure specific to medical and health care-related

**Table 2 - Individual DREEM Items Interpreted as Positive and Problematic by HDR Chiropractic Students.**

| Positive Items (mean ± SD)           | Problematic Items (mean ± SD)  |
|--------------------------------------|--|
| Research is stimulating. (3.5 ± 0.6) | I have good friends doing higher-degree research. (2.0 ± 1.5)                                      |
|                                      | Undergraduate studies have been a good preparation for higher-degree research courses. (1.7 ± 1.2) |
|                                      | I am able to memorize all I need. (1.9 ± 1.0)  |

Abbreviations: DREEM, Dundee Ready Education Environment Measure; HDR, higher-degree research.



courses. The instrument has been used to compare different medical schools and used alongside qualitative data, allowing actions to address common causes for student dissatisfaction to be undertaken.<sup>25</sup> In this study, 3 items scored less than 2.0: “Undergraduate studies have been a good preparation for higher-degree research courses,” “I am able to memorize all I need,” and “I have good friends doing higher-degree research.” The low score to “memorize all I need” was analogous with all published reports.<sup>20,23,24</sup> As discussed by Whittle et al,<sup>25</sup> this reflects students’ understanding of the enduring need to seek out new information throughout their studies and subsequent careers. The score of subscales reflect that the students’ perceptions of learning, the supervisors, and the atmosphere are positive, and that their academic and social self-perceptions are also positive. This leads to optimism for the well-being of HDR chiropractic students and encouraging for future students interested in HDR. We hope that the publication of this positive learning environment and the report that current HDR chiropractic students report no problems with gaining access to expertise in the research field, supervisors, literature, and research resources may entice more chiropractors to enter the field of research.

The DREEM was chosen because it is the most widely used contemporary measure of the medical education environment and it has been used in a variety of health care settings and internationally across schools. In a letter to the editor, Jeyashree<sup>26</sup> discussed that the 5 domains of DREEM may be used to assess the educational environment of postgraduate students,<sup>27</sup> and it has been used in family medicine in India.<sup>26</sup> While it has been reported suitable to being administered on postgraduate students with minimal modifications,<sup>27</sup> this study did have moderate modifications (Appendix A). The DREEM’s psychometric properties have been tested in an osteopathy student population, and even though this is relatively close to a chiropractic student population,<sup>28</sup> psychometric evaluations should be applied to a future modified version. Initial results among the osteopathic student population were mixed for the total score; the 5 subscales achieved model fit,<sup>28</sup> but other authors have not been able to confirm this 5-structure solution of the DREEM.<sup>29–31</sup>

This paper has outlined the motivations and challenges of HDR and the perception of the educational environment of HDR. Primary motivations include improving the evidence base for chiropractic care (and therefore providing evidence for chiropractic care that may result in public health and policy change) and improving the lives of people visiting a chiropractor. The greatest challenges faced by HDR chiropractic students are negative attitudes toward chiropractic and that chiropractic research has low prestige. In regard to the retention of researchers based around their specific research interests and managing personal finances, support must first come from within the profession to understand this particular subset of practitioners who engage in HDR. Irrespective of inter- and intraprofessional recognition, the educational environment of HDR chiropractic students was reported to be positive; as this makes an important contribution to

student learning, it will shape confident early-career researchers. It seems that initiatives to build research capacity and fund scholarships for emerging research in chiropractic are justified; however, such successes will be measured by the output of HDR chiropractic students in the coming years.

### **Limitations of This Study**

This study was an online survey and recruitment was driven via e-mail from 2 professional bodies, tertiary institutions, and academic supervisors to contact HDR students. While every attempt was made to contact HDR students, there may be students who did not respond to the survey; therefore this is only a descriptive account of the 22 HDR chiropractic students who answered this survey. Furthermore, analysis of the results showed that in 2 instances people responding to the online survey first logged in and were excluded from the study, followed by a login and inclusion in the study. We excluded respondents who answered no to the question “Are you currently enrolled as a higher-degree research student at an Australian university?” If a person was not enrolled but answered yes, they may have entered the study. The response rate of individual items throughout the survey remained at 22, and therefore the authors do not believe unsolicited persons answered the study questions. This study is only descriptive of Australian HDR chiropractic students and cannot be generalizable to other countries. It warrants future replication to assess HDR students internationally; however, psychometric evaluation, including the internal consistency and face validity of the modified DREEM, is recommended prior to future use. Future studies could also consider a mixed-methods study design combining open and closed questions together with qualitative data from interviews or semistructured interviews.

### **Implications of Findings**

This study will be the first study of its kind to provide information on the HDR chiropractic student experience. As a result, we hope the information gained will provide a greater understanding of the motivations and challenges that surround career development in chiropractic research. Ultimately, providing a supportive and productive research arena will encourage current and future students to engage in chiropractic research and help build chiropractic research capacity.

## **CONCLUSION**

This study is the first study to describe HDR chiropractic students, who are essentially PhD students enrolled in part-time study and not supported by a scholarship. Primary motivations to undertake study included bridging the gap in an evidence base for the chiropractic profession. The reason participants remained engaged in research was their specific research topic. Challenges included not only a negative attitude toward the chiropractic profession but also negative attitudes toward researchers from within the profession. The HDR

educational environment was perceived to be positive, which should be encouraging for chiropractors looking to enroll in a research degree. By acknowledging the issues that surround emerging researchers in chiropractic, the profession is better placed to foster academics and build research capacity.

## FUNDING AND CONFLICTS OF INTEREST

This work was funded internally. The authors have no conflicts of interest to declare relevant to this work.

## About the Authors

Katie de Luca is a practicing chiropractor and graduate student at University of Newcastle (18 Palm Court, South West Rocks, NSW 2431, Australia; [chirokatie@live.com.au](mailto:chirokatie@live.com.au)). Peter Tuchin is an associate professor at Macquarie University (Waterloo Road, North Ryde, NSW 2113, Australia; [peter.tuchin@mq.edu.au](mailto:peter.tuchin@mq.edu.au)). Rod Bonello is a professor at Murdoch University (4 Gees Avenue, Strathfield, NSW 2135, Australia; [rpbonello@gmail.com](mailto:rpbonello@gmail.com)). Address correspondence to Katie de Luca, 18 Palm Court, South West Rocks, NSW 2431, Australia; [chirokatie@live.com.au](mailto:chirokatie@live.com.au). This article was received December 3, 2014; revised January 20 and March 17, 2015; and accepted April 4, 2015.

## Author Contributions

Concept development: KD. Design: KD, PT, RB. Supervision: KD. Data collection/processing: KD. Analysis/interpretation: KD, PT, RB. Literature search: KD. Writing: KD, PT, RB. Critical review: KD, PT, RB.

© 2015 Association of Chiropractic Colleges

## REFERENCES

1. Sackett DL, Rosenberg WM, Gray J, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't: it's about integrating individual clinical expertise and the best external evidence. *BMJ*. 1996;312:71–72.
2. Hoffman T, Bennett S, Del Mar C. *Evidence-Based Practice Across the Health Professions*. Churchill, Australia: Elsevier; 2013.
3. Lothe L, Bolton J. Increasing research capacity in the chiropractic profession: a case study and evaluation of an innovative research program in Norway. *J Chiropr Educ*. 2013;27:40–47.
4. Bussieres A, Cote P, French S, et al. Creating a chiropractic practice-based research network (PBRN): enhancing the management of musculoskeletal care. *J Can Chiropr Assoc*. 2014;58:8–15.
5. Palmgren PJ, Chandratilake M. Perception of educational environment among undergraduate students in a

- chiropractic training institution. *J Chiropr Educ*. 2011; 25:151–63.
6. French SD, Marshall SJ, Webb M, Tucker C. Chiropractic and osteopathic education at Royal Melbourne Institute of Technology. A student perspective. *Australas Chiropr Osteopathy*. 1999;8:10–15.
7. Till H. Climate studies: can students' perceptions of the ideal educational environment be of use for institutional planning and resource utilization? *Med Teach*. 2005;27:332–337.
8. Banzai R, Derby DC, Long CR, Hondras MA. International web survey of chiropractic students about evidence-based practice: a pilot study. *Chiropr Man Ther*. 2011;19:6.
9. Hecimovich MD, Volet SE. Importance of building confidence in patient communication and clinical skills among chiropractic students. *J Chiropr Educ*. 2009;23: 151–164.
10. Mrozek JP, Till H, Taylor-Vaisey AL, Wickes D. Research in chiropractic education: an update. *J Manipulative Physiol Ther*. 2006;29:762–773.
11. Taguchi N, Ogawa T, Sasahara H. Japanese dental trainees' perceptions of educational environment in postgraduate training. *Med Teach*. 2008;30:e189–193.
12. Clapham M, Wall D, Batchelor A. Educational environment in intensive care medicine—use of Postgraduate Hospital Educational Environment Measure (PHEEM). *Med Teach*. 2007;29:e184–191.
13. Vieira JE. The postgraduate hospital educational environment measure (PHEEM) questionnaire identifies quality of instruction as a key factor predicting academic achievement. *Clinics (Sao Paulo)*. 2008;63: 741–746.
14. Shokoohi S, Hossein Emami A, Mohammadi A, Ahmadi S, Mojtahedzadeh R. Psychometric properties of the postgraduate hospital educational environment measure in an Iranian hospital setting. *Med Educ Online*. 2014;19:24546.
15. Al-Shiekh MH, Ismail MH, Al-Khater SA. Validation of the postgraduate hospital educational environment measure at a Saudi university medical school. *Saudi Med J*. 2014;35:734–738.
16. Riquelme A, Padilla O, Herrera C, et al. Development of ACLEEM questionnaire, an instrument measuring residents' educational environment in postgraduate ambulatory setting. *Med Teach*. 2013;35:e861–6.
17. Tokuda Y, Goto E, Otaki J, et al. Undergraduate educational environment, perceived preparedness for postgraduate clinical training, and pass rate on the National Medical Licensure Examination in Japan. *BMC Med Educ*. 2010;10:35.
18. Roff S. The Dundee Ready Educational Environment Measure (DREEM)—a generic instrument for measuring students' perceptions of undergraduate health professions curricula. *Med Teach*. 2005;27:322–325.
19. Roff S, McAleer S, Harden R, et al. Development and validation of the Dundee Ready Education Environment Measure (DREEM). *Med Teach*. 1997;19:295–9.
20. Al-Hazimi A, Zaini R, Al-Hyiani A, et al. Educational environment in traditional and innovative medical

- schools: a study in four undergraduate medical schools. *Educ Health*. 2004;17:192–203.
21. Thomas B, Abraham R, Alexander M, Ramnarayan K. Students' perceptions regarding educational environment in an Indian dental school. *Med Teach*. 2009; 31:185–188.
  22. Mohd Said N, Rogayah J, Hafizah A. A study of learning environments in the kulliyah (faculty) of nursing, International Islamic University Malaysia. *Malays J Med Sci*. 2009;16:15–24.
  23. Till H. Identifying the perceived weaknesses of a new curriculum by means of the Dundee Ready Education Environment Measure (DREEM) Inventory. *Med Teach*. 2004;26:39–45.
  24. Roff S, McAleer S, Ifere OS, Bhattacharya S. A global diagnostic tool for measuring educational environment: comparing Nigeria and Nepal. *Med Teach*. 2001; 23:378–382.
  25. Whittle SR, Whelan B, Murdoch-Eaton DG. DREEM and beyond: studies of the educational environment as a means for its enhancement. *Educ Health*. 2007;20:7.
  26. Khan AS, Akturk Z, Al-Megbil T. Evaluation of the learning environment for diploma in family medicine with the Dundee Ready Education Environment (DREEM) Inventory. *J Educ Eval Health Prof*. 2010; 7:2.
  27. Jeyashree K, Patro BK. The potential use of DREEM in assessing the perceived educational environment of postgraduate public health students. *Med Teach*. 2013; 35:339–340.
  28. Vaughan B, Mulcahy J, McLaughlin P. The DREEM, part 2: psychometric properties in an osteopathic student population. *BMC Med Educ*. 2014;14:100.
  29. Hammond SM, O'Rourke M, Kelly M, Bennett D, O'Flynn S. A psychometric appraisal of the DREEM. *BMC Med Educ*. 2012;12:2.
  30. Jakobsson U, Danielsen N, Edgren G. Psychometric evaluation of the Dundee Ready Educational Environment Measure: Swedish version. *Med Teach*. 2011; 33:e267–274.
  31. Dimoliatis ID, Vasilaki E, Anastassopoulos P, Ioannidis JP, Roff S. Validation of the Greek translation of the Dundee Ready Education Environment Measure (DREEM). *Educ Health*. 2010;23:348.

## Appendix A - A Modified Dundee Ready Education Environment Measure (DREEM) to Assess Higher-Degree Research Chiropractic Students

Respondents were asked to indicate whether they strongly agreed, agreed, were unsure, disagreed, or strongly disagreed with the statements below with regard to how they perceived the higher-degree research course.

1. I am encouraged to participate in research.
2. Academic supervisors are knowledgeable.
3. There is a good support system for higher-degree research students who get stressed.
4. I am too tired to enjoy my research studies.
5. Learning strategies which worked for me before continue to work for me now.
6. Academic supervisors are patient with higher-degree research students.
7. Research is stimulating.
8. Academic supervisors disrespect higher-degree research students.
9. Academic supervisors are authoritarian.
10. I am confident about completing my higher-degree research course.
11. The atmosphere is relaxed with my academic supervisors.
12. Time committed to my higher-degree research course is well managed.
13. Higher-degree research is student centered.
14. I am rarely bored whilst doing my higher-degree research course.
15. I have good friends doing higher-degree research.
16. Academic supervision helps to develop my research competence.
17. Independent learning is a problem in higher-degree research.
18. Academic supervisors have good communication skills with students.
19. My social life is good.
20. My academic supervision is well focused.
21. I feel I am being prepared well for a career in research.
22. Academic supervision helps to develop my confidence.
23. The atmosphere is relaxed during my higher-degree research course.
24. Time with my academic supervisor is put to good use.
25. Academic supervision is overemphasized compared to conducting research studies.
26. Undergraduate studies have been a good preparation for higher-degree research courses.
27. I am able to memorize all I need.
28. I seldom feel lonely.
29. Academic supervisors are good at providing feedback to higher-degree research students.

30. There are opportunities for me to develop interpersonal skills.
31. I have learnt a lot about empathy in my profession.
32. Academic supervisors provide constructive criticism.
33. I feel comfortable doing research activities, socially.
34. The atmosphere is relaxed during research activities.
35. I find the higher-degree research student experience disappointing.
36. I am able to concentrate well.
37. Academic supervisors give clear instructions.
38. I am clear about the objectives of my research.
39. Academic supervisors get angry.
40. Academic supervisors are well prepared for higher-degree research supervision.
41. My research skills are being well developed.
42. The enjoyment outweighs the stress of higher-degree research.
43. The atmosphere motivates me as a researcher.
44. My academic supervisor encourages me to be an active researcher.
45. Much of what I have to do seems relevant to a career in research.
46. My accommodation is pleasant.
47. Long-term learning is emphasized over short-term learning.
48. Higher-degree research is academic supervisor centered.
49. I feel able to ask the questions I want.
50. Higher-degree research students irritate academic supervisors.